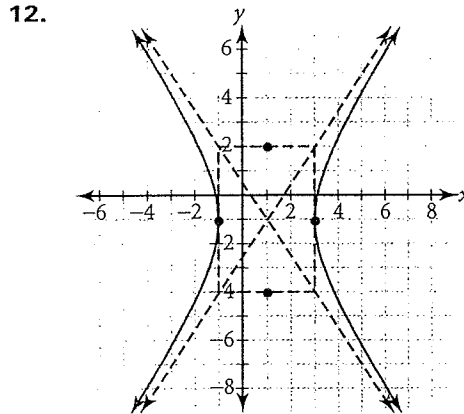
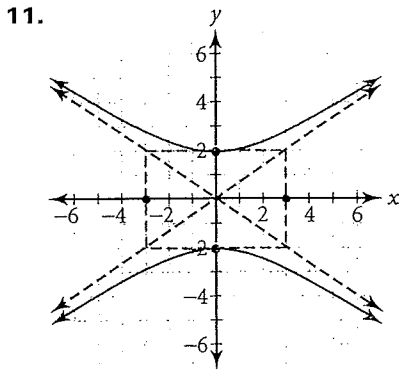
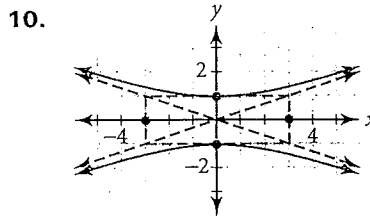
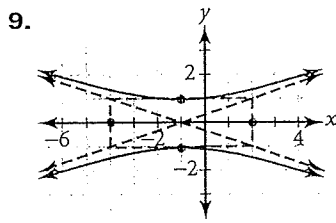
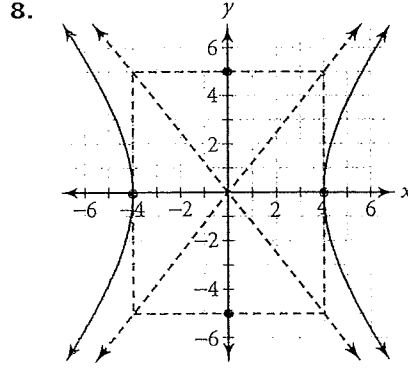
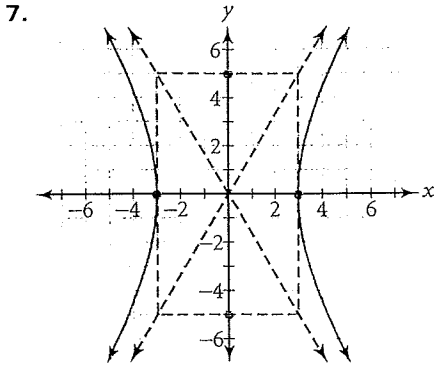


Practice and Apply

Write the standard equation for each hyperbola.



Graph each hyperbola. Label the center, vertices, co-vertices, foci, and asymptotes.

13. $x^2 - y^2 = 1$

14. $y^2 - x^2 = 1$

15. $\frac{y^2}{3^2} - \frac{x^2}{5^2} = 1$

16. $\frac{x^2}{2^2} - \frac{y^2}{3^2} = 1$

17. $x^2 - \frac{y^2}{2^2} = 1$

18. $y^2 - \frac{x^2}{3^2} = 1$

19. $\frac{y^2}{100} - \frac{x^2}{64} = 1$

20. $\frac{x^2}{25} - \frac{y^2}{36} = 1$

21. $4x^2 - 25y^2 = 100$

22. $36y^2 - 4x^2 = 144$

23. $\frac{(x-1)^2}{2^2} - \frac{(y+2)^2}{3^2} = 1$

24. $\frac{(x+2)^2}{3^2} - \frac{(y-2)^2}{4^2} = 1$

For Exercises 25–32, write the standard equation for the hyperbola with the given characteristics.

25. vertices: $(-3, 0)$ and $(3, 0)$; co-vertices: $(0, -5)$ and $(0, 5)$

26. vertices: $(0, -2)$ and $(0, 2)$; co-vertices: $(-4, 0)$ and $(4, 0)$

27. vertices: $(0, -4)$ and $(0, 4)$; foci: $(0, -5)$ and $(0, 5)$

28. vertices: $(-5, 0)$ and $(5, 0)$; foci: $(-7, 0)$ and $(7, 0)$

29. co-vertices: $(0, -2)$ and $(0, 2)$; foci: $(-3, 0)$ and $(3, 0)$
30. co-vertices: $(-1, 0)$ and $(1, 0)$; foci: $(0, -2)$ and $(0, 2)$
31. center: $(2, 3)$; vertices: $(-1, 3)$ and $(5, 3)$; co-vertices: $(2, -2)$ and $(2, 8)$
32. center: $(-1, -3)$; vertices: $(-6, -3)$ and $(4, -3)$; co-vertices: $(-1, -6)$ and $(-1, 0)$

Write the standard equation for each hyperbola.

- | | |
|---------------------------------------|---|
| 33. $4x^2 - 9y^2 - 8x + 54y = 113$ | 34. $16x^2 - 25y^2 - 32x + 100y = 484$ |
| 35. $4y^2 - 36x^2 - 72x + 8y = 176$ | 36. $25y^2 - 16x^2 + 64x - 50y = 439$ |
| 37. $y^2 - 9x^2 - 6y = 36 + 36x$ | 38. $16x^2 - 9y^2 + 64x = 89 - 18y$ |
| 39. $16x^2 + 64y - 256 = 16y^2 - 64x$ | 40. $25y^2 + 100x - 100y - 625 = 25x^2$ |
| 41. $3y^2 + 20x = 23 + 5x^2 + 12y$ | 42. $7x^2 - 5y^2 = 48 - 20y - 14x$ |